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ABSTRACT

This study of facilities constructed from 1965 through 1969 attempted to determine how to effect economy and efficiency of function in future school buildings; and to determine whether State Board of Education regulations were viewed as underrestrictive, reasonable, or overrestrictive; whether educational specifications were developed and used by the architect in planning the buildings; and whether the buildings were being used in the ways intended. A special survey form was developed to gather data from principals of buildings, superintendents of schools, teachers, building and grounds supervisors, and custodians. Questions relating to economics, State board regulations, the better and the less satisfactory features, and the extent of communication between the architect and educators were answered from interview responses of the various local school people. Data concerning room schedule practices (including utilization, number of pupils, and multipurpose use spaces) were gathered from tables. The report lists common mistakes to avoid, underscores the need for comprehensively documented educational specifications, and provides suggestions and recommendations for school personnel planning new facilities. (Photographs may reproduce poorly.) (Author)

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U.S. DEPARTMENT OF HEALTH
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# Better School Buildings for Less Money:

## A Report of A Survey of 50 Pennsylvania School Buidings

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Pennsylvania Department of Education 1973

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# Better School Buildings for Less Money

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March 1973

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## FOREWORD

This study is recommended to school personnel who are planning new facilities.

Common mistakes to avoid are listed, the need for comprehensively documented educational specifications is emphasized and a series of valuable suggestions and recommendations are given.

Although this research report is not to be interpreted as official state policy, I believe you will find it helpful in designing more educationally sound and economical school facilities.

Donald M. Carroll, Jr.
Commissioner for Basic Education

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## SUMMARY

This study of recently constructed school buildings in Pennsylvania was performed at the request of the Pennsylvania Department of Education, Office of Basic Education. Its basic purpose was to determine how to effect economy and efficiency of function in future school buildings. Other purposes included determinations of whether State Board of Education regulations were viewed as underrestrictive, reasonable or overrestrictive, whether educational specifications were developed and used by the architect in planning the building and, finally, whether the building was being used in the way it was intended.

A special survey form was developed to gather data from principals of buildings, superintendents of schools, teachers, building and grounds supervisors and custodians. The 50 schools were selected from a list of schools constructed from 1965 through 1969 in Pennsylvania. The state was divided into six geographical regions and the percentage of schools completed in each section was determined. Ten high schools, 10 junior high schools, 20 elementary schools, five middle schools and five for which State Board exceptions were granted were visited. An attempt was made to select schools built by as many different architects as possible. Thirty-eight architects were represented. Since the schools were selected on a sample basis and had any other sample of schools or the total population of the schools been taken, the same findings would probably have appeared.

Participants were assured that the survey would not be used as a faultfinding search, but one which would help architects, administrators, school board members and state agencies plan and build more economical and efficient educational facilities.

Questions relating to economies, state board regulations, the better and less satisfactory features and the extent of communication between the architect and educators were answered from interview responses of the various local school people. Room schedule practices, including utilization and number of pupils and multipurpose use spaces information was gathered from tables. Questions relating to site, educational specifications, planning activities, flexibility, spatial relationships and environmental factors, structural exceptions, open space and multiple use spaces were again answered through interview and inspection.

The following essential observations and recommendations are made:

1. The planners of future school buildings should gather input from a wider range of people, particularly classroom teachers, than have been involved in the past.

2. Better design of facilities and more careful selection of material is necessary in order to eliminate the costly and recurrent maintenance problems which have been observed during the survey.

3. The large majority of schools visited during the survey had significant amounts of inefficiently used space which could have been, with better design, put to use in areas where there were shortages of space, particularly storage space.

4. Proper acoustical treatment of schools is technologically possible; thus, there is no reason to accept in future buildings the types of acoustical inefficiencies observed during the survey.

5. The amount of fenestration in school buildings should be greatly reduced as permitted by recent state board regulations.

6. Much more flexibility in state regulations and standards is needed to allow districts the necessary freedom to design buildings to fit their special needs and anticipated programs. The regulations under which the buildings were built tended to inhibit innovation and perpetuate the traditional type of building.

7. The survey results indicate many areas where cost savings could have been effected in school buildings--more comprehensive and detailed overall planning of future school facilities is needed to translate these possibilities into realities.

8. A detailed and exhaustive statement of the envisioned educational program and comprehensive analysis of the implications of this program in terms of building design should be the first steps in the planning of future school facilities. If this is done, many of the design mistakes observed during the survey can be eliminated in the future.

9. Completely flat roofs invariably leaked. Completely flat roofs, location of drains near structural supports and improper installation of flashing were causes of problems.

## BACKGROUND OF THE PROBLEM

Since the end of World War II, the public school administrator has been more concerned with school buildings than at any time in history. This concern was aggravated by a number of things.

1. The inability to engage in extensive school construction during the depression years of the 1930s due to a lack of money.

2. The diversion of national resources, manpower and construction materials due to the second World War in the early to mid 1940s.

3. The preoccupation of the nation with a return to and the re-establishment of a peacetime economy.

4. A burgeoning pupil population which started in the mid 1940s and has continued almost to the present time.

5. A high mobility of population that took people from places where schools existed to other places where new schools had to be provided.

6. New patterns of district reorganization that called for new and different building facilities.

7. The increased school holding power at all academic levels.

Starting with the late 1940s, school administrators had to become concerned with housing the pupil population. Moreover, the school building deficiencies came upon them so abruptly that they had to be dealt with hurriedly. Consequently, school administrators did what came naturally. They alerted their school boards to the need, whereupon the services of architects were secured and plans for new buildings were made. Unfortunately, however, little was done in the way of real planning other than to accommodate the usual curricular program and provide space for the expected pupil population. In short, the architects were usually told, "We need a school for X number of students and we plan to offer the usual curriculum expected by the Department of Public Instruction. Design us a building."

By the early 1950s, the wave of elementary pupils was beginning to enroll in school in great numbers. Moreover, there was concurrent realignment of the school districts into reorganized systems--unions, mergers and, more extensively, jointures.

Money was needed for new schools and for the remodeling and/or renovation of old ones. Cooperative effort to provide these facilities through district reorganization seemed logical.

The Municipal Authorities Act of 1947 made it possible for school districts to circumvent the restrictions of the State Constitution with respect to the seven per cent debt limit based on assessed valuation. But even with this advantage, the burden of required capital expenditure was

too great for local school districts. The legislature recognized the problem and enacted additional legislation which, for the first time, made the Commonwealth a participant in approved capital expenditures for new school buildings.

Despite the fact that since 1950 over $2 million have been spent in the Commonwealth on new school buildings, not enough was done in deliberate planning to assure the best and most functional and economical facilities. The administrators were given a directive, following the May 11, 1967 meeting of the State Board of Education, that a long-range developmental program for school building construction must be filed with the Department of Education.

1. All school districts were encouraged to prepare and file their plans as soon as feasible.

2. For school districts contemplating buildings, the plans had to be filed with a school building application.

3. By July 1, 1969, all school districts were to have filed their long-range development plans.

However, long-range developmental plans were not filed on time by the school districts for a variety of reasons:

1. Some districts were in litigation over reorganization, Act 299, and did not know how their districts would finally be aligned.

2. Some districts were in a situation of changing administrative personnel and never got started.

3. There were instances where districts were not confronted with a building program. Since there were not any apparent penalties for noncompliance, the directive was ignored.

4. Some administrators felt they did not have the time, inclination, or talent to do the planning, and because of the demand upon the services of outside agencies, they were unable to get aid.

The updating of the long-range developmental plans--a procedure that is required of all districts every two years--is already in arrears; some districts should be submitting their second revision.

The shortcomings of the school building programs of the 1950s and 1960s were readily discernible. When the state made money available, it established maximum dollar limitations beyond which projects could not be approved for state subsidy as follows:

1. In 1953, Act 431 approved a ceiling of $425 million.
2. In March 1956, Act 417 increased the amount in four years as follows:
   a. in 1956 to a ceiling of $625 million

b. in 1957 to a ceiling of $725 million
c. in 1958 to a ceiling of $825 million
d. in 1959 to a ceiling of $925 million
e. In July 1959, the ceiling was increased in two steps to $1.3 billion.

Although these limits were raised by the legislature, the ceiling was never high enough to satisfy the prospective number of applicants. In July 1961, Act 500 removed ceiling limitations.

A quotation from the School Administrators Handbook Major Code 61-200 describes the school construction situation which existed.

> Much of the construction was undertaken in great haste. Inasmuch as applications were processed in chronological order, many were filed without any appreciable planning simply to get "in line" ahead of neighboring schools. Many of the administrative units were too small to warrant educationally sound building programs. This situation was abetted by the philosophy of the 1950 county plans . . . .
>
> Act 299 of 1963 resulted in larger school districts. . . . The time is now to approach public school construction with a scientific appraisal of the educational requirements of the entire administrative unit.

The multiplicity of problems arising from hasty school design and construction and the imminence of a changing curriculum, together with changing instructional strategies, made it evident that merely preparing a long-range developmental plan was not enough.

While intended to be primarily concerned with buildings, the long-range guidelines envisioned a determination of need and the satisfaction of that need only in terms of location and financial ability to secure adequate school building facilities. No requirement was included as to what the school building was to be like to optimally implement the educational program.

With long-range developmental planning presumably an accomplished fact, the State Board of Education took the next logical step. In 1969 regulations of the State Board of Education, Chapter 3, School Buildings, Section A, Basic Education, state:

> In preparation for the design of educational facilities, a school district SHALL prepare a statement of educational specifications which shall describe the educational program to be offered, instructional grouping patterns, schedule characteristics, anticipated instructional procedures, relationships to exist among

program segments, and any unique practices to be accommodated. The description shall be in terms which enable the architect to design spaces and select materials best suited to promote the educational goals of the school district and of the Commonwealth.

The Pennsylvania Department of Education, Bureau of Administrative Leadership Services published a document entitled, GUIDELINES FOR THE DEVELOPMENT OF EDUCATIONAL SPECIFICATIONS FOR SCHOOL CONSTRUCTION, June 1971. Henceforth, in order to proceed with any new school construction, it is necessary to submit documented educational specifications to the Bureau of School Buildings and secure approval therefrom.

Although the Department of Education required long-range plans and written educational specifications and approved architectural plans, there was a realization that very little knowledge existed regarding how the completed buildings meet the educational needs of the district. There had never been a concerted effort made to ascertain how the building users--administrators, teachers, pupils, custodians--viewed their school buildings. Accordingly, this study was conducted to seek answers to the following major questions:

1. Were educational specifications developed and documented before the architect initiated planning for the new building?

2. Did the architect design the building according to the educational philosophy of the district and in keeping with the educational specifications?

3. Is the building being used in the way it was intended when the educational specifications were drafted?

4. Are the State Board of Education regulations satisfactory and reasonable? Are they overrestrictive or underrestrictive?

5. Could economies have been effected in the building that would have in no way impaired the quality and effectiveness of the educational program?

## PROCEDURES

### Construction of the Survey Instrument

The specifications for the appraisal required the design of an instrument which would enable objective recording of observations relating to State Board regulations and common practices. The instrument was to measure the extent of occupancy and usage of spaces, extent of actual usage, or provisions for flexible arrangement, prevalence of variable group and individual activities (where such special provisions were made), judgement evaluations of room sizes, fenestration practices and construction details.

A five-point scale was selected to develop questions for the following topics: Site, Educational Specifications, Planning Activities, Flexibility, Spatial Relationship and Environmental Factors, Multiple Use Spaces and Open Spaces.

Questions used in the interview section were grouped under the above topics in the first part of the instrument; questions to be verified by inspection were grouped under the same topics in Part II of the instrument. Questions relating to structural exceptions were written with a Yes or No response format.

A table was developed to gather data on multiple use spaces. This included intended purposes, actual purposes, most satisfactory uses, least satisfactory uses, scheduling problems and general comments.

A room schedule practices table was prepared to gather information, such as type of room, actual periods occupied per week and possible periods per week, which could be used to calculate a use factor for spaces with less than full utilization.

A form was designed to record the number of pupils who were instructed in secondary schools by subject area and type of room for social science, English, mathematics, science and one of the "exceptional" disciplines (art, music, industrial arts, physical education and home economics).

It was decided that elementary buildings with departmental programs would be asked to list subject matter areas in reporting. Elementary schools with self-contained classes would list four different grade levels and an "exceptional" discipline when offered.

A special interview section was developed for gathering building users' observations regarding state board regulations. These questions related to state board regulations regarding site, reimbursable instructional spaces (room schedule), instructional space allocation (square footage), noninstructional space allocation (storage areas, corridors, etc.) and standards for lighting, ventilating and heating. It was decided that responses were to be recorded as being overrestrictive, reasonable or underrestrictive with regard to the above state board regulations.

Further, it was decided that the interview section would gather information concerning: (1) better design; (2) less satisfactory features; (3) more innovative features; (4) suggestions for increased economy; (5) suggestions for improving function by additions and alternatives which would not have added significantly to the cost of the building and (6) suggestions for changes in educational specifications to improve communications between educators and architects.

Selection of Sample

The sample included 50 school buildings, completed between 1965 and 1969, chosen from six regions of the Commonwealth.

The percentage of the total number of new schools built during the five-year interval was determined for six geographical regions of the state. This percentage was then applied to the anticipated sample of 50 to get the number of schools to be visited in each region. As nearly as possible, the sample was further stratified for each region to get proportional representation with respect to types of schools.

Numbers by type of schools visited were: elementary, 20; junior high, 10; senior high, 10; middle, 5; and schools with exceptions approved by the state board, 5.

Five schools for which exceptions were granted by the State Board of Education were selected from a list of all schools granted exceptions from 1965 to 1969. The most frequent exceptions were for reduction in fenestration requirements, windowless school buildings and classrooms partially below ground level. Other exceptions were granted for reductions of ceiling height, less than 500 pupil capacity, deviation from minimum standard of room sizes, change in types of fenestration, artificial lighting standards and site requirements.

The five schools selected for the sample included one with reduced ceiling heights, reduced fenestration and complete air conditioning. The second school had reduced fenestration, interior rooms and air conditioning. The third was completely windowless and air conditioned. The fourth had classrooms below ground level and the fifth had reduced fenestration, several windowless classrooms and air conditioning.

Data Gathering Strategy

Each of the 50 buildings surveyed were visited by a three-member evaluation team. In all instances the team included the consultant, Professor of Education, Walter DeLacy, The Pennsylvania State University and the Director of Applied Research, John G. Cober, Bureau of Information Systems, Pennsylvania Department of Education, the director of the project. The third member of the visitation team was one of several individuals from the Division of Research.

The evaluation procedure, while dictated by individual scheduling considerations, followed essentially the same pattern in most cases. The evaluation began with an interview of people involved in the planning of the building to elicit information concerning state board regulations. The satisfactory, unsatisfactory and innovative features of the building were also listed. Features that might have been eliminated or incorporated for economies without impairing the effectiveness of the educational program were requested.

Suggestions were solicited for improving communications between educators and the architect during the planning and design stages of a building project. Usually, the school people interviewed included the district superintendent, assistant superintendent of schools, business manager, building principal or other district administrative staff members involved in planning of the project.

After the initial interview concerning state board regulations and building characteristics, the interview section (questions 1 through 63) of the appraisal instrument was completed. Most often, the building principal was the primary source of this data.

Following the interviews, the evaluation team, guided by the building principal and/or chief custodian, toured the building and site. During this tour, a series of photographs was taken by a team member.

The next step in the evaluation procedure was completion of the inspection section (questions 64 through 103) of the appraisal instrument.

Finally, where it was possible, a group of teachers were questioned about building characteristics. Several of the visitations were made during the summer months, making this interview impossible . Generally, except for the state board regulation questions, these people were asked the same questions as the administrators about building characteristics, i.e., innovative features, satisfactory and unsatisfactory features, design communication, etc.

The final step in the data collection procedure involved the clarification of any discrepancies in the ratings of the three evaluation team members. Where individual ratings varied considerably, these differences were discussed and a common score determined. The final rating for each item represented a consensus and the overall rating for each school was a "pooled" team rating.

The result of the above described procedure in each instance was: (1) interview statements from the administrative staff; (2) a completed appraisal form; (3) interview statements from the teaching staff (where possible) and (4) a series of photographs. In addition, an appraisal form was left with the building principal to complete unassisted for comparison purposes. These were then mailed to the evaluation team.

## FINDINGS

### Educational Specifications

Formal written educational specifications were prepared for only 20 per cent of the 50 schools.

Although such educational specifications were not available in 80 per cent of the schools visited, varying amounts of planning activities were conducted, ranging from great participation by the administration, faculty, school board and architect to only limited interaction between the architect and school superintendent. Some administrators involved the teachers in meetings with the architect and administrators.

Administrators indicated that architects incorporated educational specifications in the building plans as follows: 8 gave the highest rating; 23, the above average rating; 12, the average rating; 3, the below average rating and only 1, the lowest rating. In general, it was observed that those schools which were built with insufficient planning usually were of the inflexible, traditional, egg crate type.

### Planning Decisions

Decisions must always be made regarding key features of any school building. Information was gathered to determine the person who most influenced decisions in certain specific areas. Multiple answers were given to certain decision areas, resulting, in some cases, in a total greater than the number of schools. Appendix B lists the 12 decision areas and the persons who exerted the most influence upon the decisions.

The architect was indicated as being most influential in deciding on a one-story or a multiple-story building, the type of roof, single or multiple building, type of materials used on corridor walls, type of frame (modular or custom), type of brick, to build or not build a bus canopy and size of parking lot.

School board members influenced decisions considerably in all areas except type of frame, type of roof and whether to construct a single or multiple building.

A school board member or members were most influential in deciding on the type of heating used (oil, gas, electricity) and type of classroom floor covering (carpeting, tile, etc.).

School superintendents influenced decisions considerably in all areas except type of roof, type of heating system, type of frame and type of brick. They were most influential in deciding on type of hallway floors and whether to use or not use air conditioning.

Open Space

Five schools were planned as open space facilities. Four principals reported that results with open space and team teaching justified this concept with a better than average rating. One principal rated this average. The adequacy of the teaching staff training for working in this environment was rated average by the three principals; one rated above average and one below average. Principals indicated that more teachers should be better prepared for open space schools.

State Board Regulations

Site: A large majority, 88 per cent, of administrators indicated site regulations were about right. Only two per cent indicated site regulations were overrestrictive. Six per cent indicated site regulations were underrestrictive, while four per cent had no response.

Reimbursable spaces (number of rooms allotted): Forty per cent of the administrators felt that the reimbursable space allotments were too restrictive. Fifty per cent felt they were about right. Six per cent felt they were underrestrictive, while four per cent had no response.

Instructional space allocation (sq. ft. of area): Forty-four per cent of the administrators felt that the instructional space allocations were overrestrictive. Again, 50 per cent felt the allocation was about right, while two per cent felt it was underrestrictive and four per cent had no response.

Noninstructional space allocation (sq. ft. for offices, storage, corridors, etc.): Forty-two per cent of administrators felt that noninstructional space allotments were overrestrictive. Fifty-four per cent felt that space allotments were about right. None felt they were underrestrictive and four per cent felt they could not evaluate this question.

Standards for lighting, ventilating, heating, etc.: Twelve per cent of the administrators felt that lighting and ventilating standards were overrestrictive. The most frequent reference was to the 70-foot candle-power requirement. Seventy-eight per cent thought the mechanical standards were about right. Six per cent thought the requirements were nonrestrictive, while four per cent indicated they did not feel knowledgeable enough about the requirements to respond.

Exceptions Granted by the State Board of Education

Some schools were granted exceptions by the State Board of Education to standards that were in effect when the buildings were planned. Study participants were asked to indicate whether the resulting building characteristics positively or negatively influence the quality of the learning atmosphere. Only a very few reported negative influences.

Although skylighting was not an exception to state board regulations, it is reported here since skylighting was sometimes used for lighting interior rooms, which was an exception. Most of the negative reactions to the use of skylights were due to blackout problems for visual aids and water leaks around the skylights.

| | Number of Schools | | |
|---|---|---|---|
| | Positive Reaction | Negative Reaction | Exception Not Present |
| Interior or windowless rooms | 27 | 1 | 22 |
| Less than normal fenestration | 25 | 1 | 24 |
| Classrooms below ground level | 8 | 0 | 42 |
| Skylighting | 27 | 7 | 16 |

Site Data

Municipal water was provided in 31 per cent of the schools, while 19 per cent of the schools relied on wells for water supply.

Only five per cent of the schools used septic tanks, 59 per cent used municipal sewage systems and 36 per cent built a sewage disposal unit.

Thirty-one per cent of the schools had a TV cable available and 69 per cent did not.

Sixty-six per cent of the school sites were rated above average as being free from hazards such as rail lines, high speed traffic arteries, airfields and high tension lines. Twenty-six per cent were rated average in this category. Excellent, below average and poor were rated two and one-half per cent each.

Sixty-seven per cent of the sites were rated above average since they were free from disturbing noises, smoke, dust and odors. Seven per cent were excellent, 19 per cent were average, seven per cent below average.

Fifty per cent of the schools reported that roads and parking facilities were ample for usual school activities. Twenty-nine per cent were reported average, 19 per cent below average and two per cent excellent. Only 33 per cent were rated more than adequate in parking for community use; 33 per cent were reported average, 29 per cent below average and two and one-half per cent both excellent and poor.

Forty-eight per cent rated as above average the development of the site in terms of provisions for both physical education and recreational programs, seven per cent rated such development as excellent, 21-1/2 per cent average, 21-1/2 per cent below average and two per cent poor.

Fifty per cent rated the location of the site in terms of proximity to the population to be served as above average. Eleven per cent rated it as excellent, 35 per cent as average, two per cent below average and two per cent poor.

Fifty-two and one-half per cent rated as above average the extent to which economy of maintenance and operation was stressed in the site's development. Forty per cent rated this as average, five per cent below average and two and one-half per cent poor.

Seventy-one per cent reported that the ratio of useful to total site acreage was excellent (91 and 100 per cent). Twelve per cent reported an above average ratio (81-90 per cent), five per cent as average (71-80 per cent), seven per cent as below average (61-70 per cent) and five per cent as poor (60 per cent or less).

Twenty-six per cent rated the reasonableness of the site's cost as above average, 21 per cent rated it excellent, 33 per cent average, 10 per cent below average and 10 per cent poor.

More Satisfactory and Innovative Features

Principals and teachers were requested to indicate what they considered the more satisfactory and innovative features of their school buildings.

The more satisfactory features of new buildings mentioned were related primarily to newer concepts in building design and use of construction materials. They included:

a. carpeting in classrooms
b. terrazo floors in corridors
c. movable walls, doors, etc.
d. closed circuit television
e. special purpose areas such as planetariums, swimming pools, etc.
f. large classrooms and storage areas
g. overall building design and the location of large group and small group areas
h. air conditioning and electric heat
i. adequate libraries
j. flexibility of open space schools

Less Satisfactory Features (see Appendix C)

Roofs: Leaking roofs were accepted as a normal condition in many of the school buildings. Roofs which did not leak were the exception. Roof bonds were required in most cases, but school districts were unhappy about the corrective work completed under the bond. Roofs were reported where copper and steel were in direct contact. This resulted in galvanic action which caused accelerated deterioration. One large flat roof on a

school located on a hilltop was rolled back by the updraft of the wind

Sites: A few sites were improperly located or too small. Sloping parking and play areas were less than satisfactory during winter weather. Poor drainage was a problem on some sites, because water was directed toward the building. Delivery trucks and buses crossed play areas in some cases. One school had the play area located across a dangerous highway. (Page 13 illustrates some of these conditions.)

Mechanical areas: Poor climate control was a common complaint. Faulty installation of heating and cooling equipment, inoperative equipment, high noise levels of fans and ventilators, excessive fuel consumption and poorly ventilated areas were all listed. Errors of omission in design caused problems such as requiring the use of a sump pump to drain the diving well of a swimming pool, because the bottom of the pool was lower than the service drain.

Floor materials: Floors with coverings such as asphalt, vinyl asbestos and vinyl tile were cited as being slippery when waxed, especially on ramps. Seamless floor coverings were generally unsatisfactory due to cracking and chipping which took place. Carpeting in art rooms was termed unsatisfactory.

Wall materials: Walls between classrooms which were not constructe above the ceiling height permitted excessive noise transmittal from room to room. Vinyl wall covering, vermiculite plaster and painted plastered walls in corridors and classrooms were difficult to maintain and generally reported unsatisfactory.

Instructional areas: The instructional area features most frequently cited as unsatisfactory largely derived from room schedule constraints which allowed an insufficient number of small instructional rooms and, therefore, caused scheduling problems. The poor location of library, offices, multipurpose rooms and physical education locker rooms were also cited. The lack of specially designed art and music rooms for elementary schools was repeatedly cited. Facilities such as libraries, multipurpose rooms, cafeterias, kitchens and physical education locker spaces were often criticized as being too small.

Noninstructional areas: The lack of adequate storage areas with high and oversize doors for heavy physical education equipment, near the gymnasium area, was a problem in several schools. The lack of a lobby or commons room for pupils and dining and lounge areas for faculty was frequently mentioned.

Building design: Small student lockers and lack of display space were frequently mentioned. The improper location of offices, toilet rooms, drinking fountains and libraries were mentioned earlier.

Acoustics: Poor acoustics throughout the school building were a problem. Noisy cafeterias were especially severe problems in some

POOR DRAINAGE, EXCESSIVELY LONG ACCESS ROAD, GENERALLY UNUSED PARKING AREA

schools. Noise penetration between classrooms and through folding partitions created unsatisfactory conditions.

Economies Suggested (see Appendix D)

Bus canopies: Almost without exception, the bus canopies observed during the survey represented unjustified expenditures of money that could have been more usefully expended elsewhere. Too often, it appears that the primary purpose of these appendages is aesthetic enhancement of the building. In many cases, because they are too high or narrow, they actually afford little protection from windblown rain or snow. Further, because their intent is, perhaps, as much aesthetic as functional, bus canopies are constructed in such a way and of such materials that they are perpetual and costly maintenance problems. (page 15)

Generally, even well constructed and functional appendages of this type are unnecessary. They are normally located in close proximity to a lobby or corridor where ample waiting space is available and thus are not needed for this purpose. Further, the sophisticated intrabuilding communication systems included in modern school facilities makes it possible, with a minimal amount of planning, to establish a bus loading procedure for inclement weather, whereby students are called from their rooms as the buses arrive. There is no need to wait outside the building.

Marble window sills: Several of the buildings visited during the survey had window sills made of marble. Admittedly, sills of this material are attractive, durable and easily maintained. However, such materials as Pennsylvania slate or steel possess the same qualities and are more economical.

Hardwood stage floors: Many of the auditorium and multipurpose room stages observed during the survey were constructed of high quality maple or oak flooring. While attractive, its use is inappropriate in these areas, since it is difficult to place nails or screws in it without splitting. A well laid fir or yellow pine floor would be less expensive, would be sufficiently serviceable and would more readily permit the fastening of scenery and other devices necessary for dramatic productions and other activities normally conducted in these areas.

TV cable in conduits: Several of the buildings visited were constructed with a TV cable distribution system channeled through conduit to outlets in individual rooms. Such a system is unwarranted and expensive. TV signal-carrying cables carry very low current, so they are not a hazard with respect to fire or shock. Moreover, they are sufficiently well constructed that they do not need protection from mechanical damage by enclosure in conduit.

Stage and interior lighting systems: A number of the buildings observed had stage lighting systems of unnecessary complexity. Sophisticated systems necessary for polished dramatic productions might be appropriate in senior

BUS CANOPIES

BUS CANOPIES AFFORD INSIGNIFICANT PROTECTION AND POSE AN EXPENSIVE MAINTENANCE PROBLEM.

high schools; they are not needed for the types of productions staged in elementary, middle or junior high schools. If included in these types of facilities, such lighting systems are an unwarranted expense. Interior lighting appeared to be more expensive than necessary in several buildings (page 17).

Excess fenestration: Modern climate control technology makes it possible to construct buildings with a minimal amount of window space. The results of the survey indicate that this should be done. There were many problems mentioned with respect to excess window space in the buildings observed. A major one was the sometimes severe discomfort caused by solar heat and glare during early fall and late spring. At these times of the year, excess window space makes the creation of an optimum learning environment extremely difficult (page 18).

In addition, windows are a natural target of pranks and vandalism and must be cleaned frequently. The cost of replacement and maintenance over the life of the building represents a significant financial outlay. Purchasing window shades and maintaining shades add to the expense (page 19).

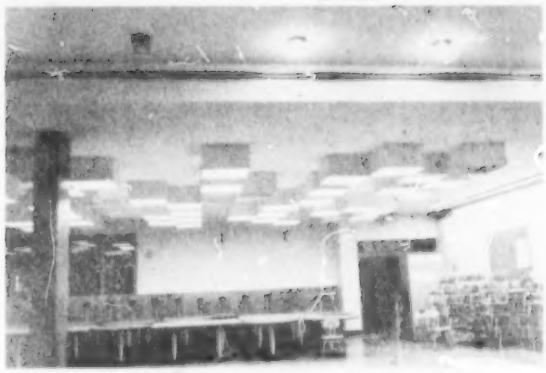
Further, the innovative instructional programs being carried on in schools today place a greater emphasis on audio-visual materials and room darkening is often required. Windows, to an extent, inhibit the use of these materials by making this darkening difficult.

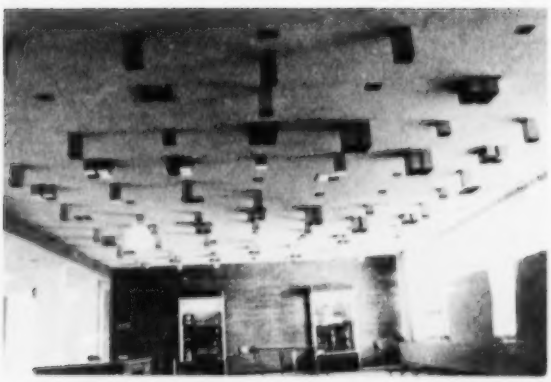
Finally, the area of a classroom taken up by windows becomes unusable for any other purpose. The potential for storage and display is lost.

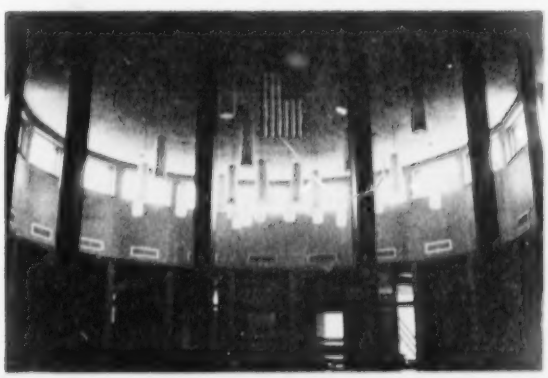
It can be argued, of course, that students and teachers need to have exposure to the outside environment in order to avoid claustrophobic feelings. The results of the survey interviews at 50 buildings indicate that this is a fallacious argument. In a climate controlled building, the outside vista is not missed. Thus, there seems to be no compelling reason to have a large area of window space in a modern school facility. There are, however, compelling reasons for not having them--comfort and cost.

Classroom doors: In a majority of the buildings visited, the evaluation team concluded that the doors to classrooms are in many cases unnecessary. In the normal course of instruction in many schools, the classroom doors are not closed. This is particularly true where carpeting is used as a floor covering, but also true in uncarpeted, acoustically efficient buildings. With adequate planning and designing, it would be quite possible to construct a school without classroom doors, except on those rooms where they were needed for security purposes. While the savings per door which would result from this would seem to be insignificant, when multiplied by the number that could be eliminated across the state, it no longer appears so. (Page 21 illustrates doors in various positions.)

DECORATIVE LIGHTING FIXTURES

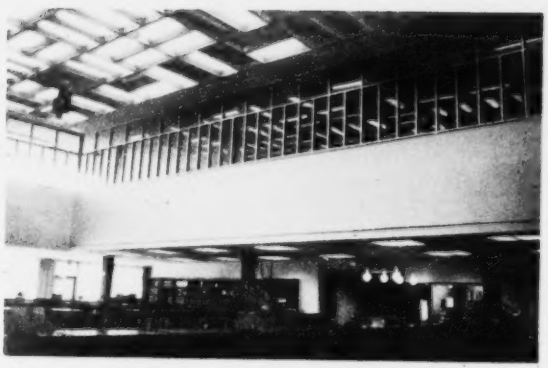


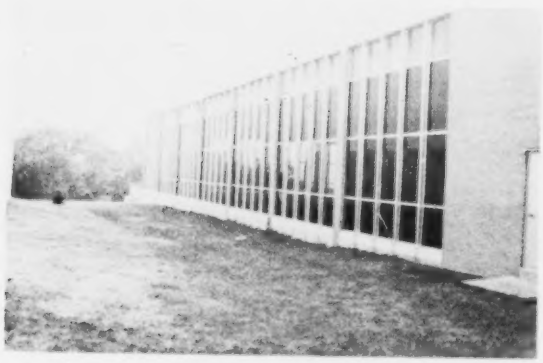


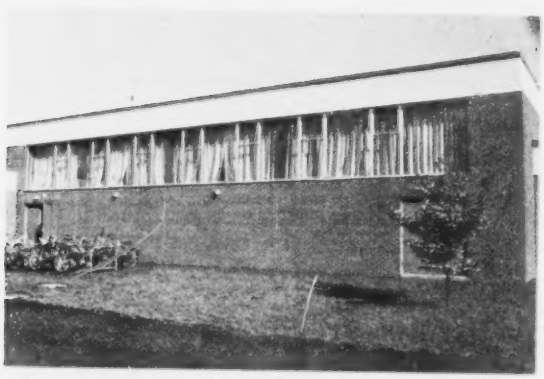


ENTRANCEWAY, LOBBY, CAFETERIA, AND LIBRARY

EXCESSIVE WINDOWS

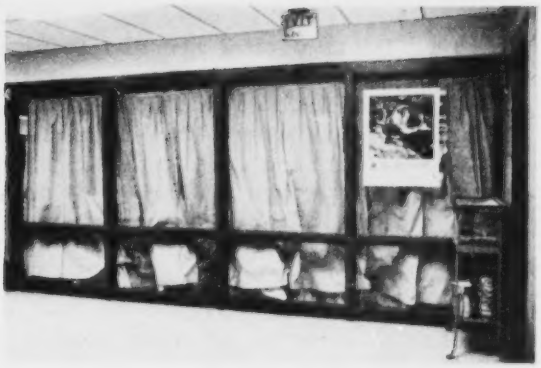


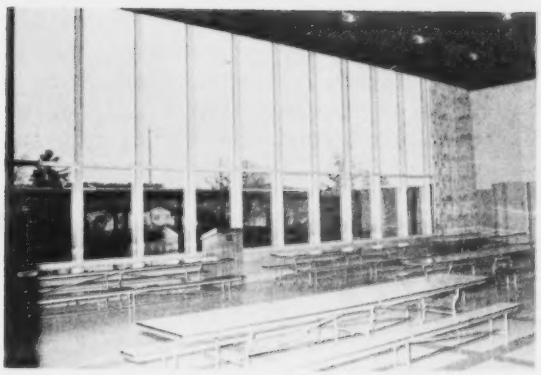




CLOSED SHADES AND DRAPERIES DRAWN TO REDUCE SOLAR HEAT, OPPOSE NATURAL LIGHT AND MAKE ARTIFICIAL LIGHTING NECESSARY

LARGE GLASS AREAS





EXTERIOR AND INTERIOR WALLS

Boilers: In many cases it does not appear necessary for a school to be built with a standby boiler whose only purpose is to serve as a replacement in case of equipment breakdown. In this day of rapid communication and transport, more dependable technology and readily available service, the probability of an extended breakdown is unlikely. This is particularly true of schools in a metropolitan area where service people are close at hand. It appears that elimination of standby boilers is a means of effecting cost saving in future schools.

Window walls in library: In several of the schools visited, the libraries were designed so that one entire wall was constructed of windows. This is wasteful of both money and space. In addition to the normal problems and expenses associated with excess fenestration, a window wall in a library creates an additional space problem. Since it is not feasible to stack books in front of windows, the wall space becomes functionally useless. This means, at least in the instances observed during the survey, that the book stacks intrude into the floor area of the library, leaving less space for chairs, work tables and the like. Thus, a library with a wall of windows is not as functional in terms of number of students efficiently served as a similarly sized area without a window wall.

Inappropriately sized stairwells and corridors: In many of the schools surveyed, inappropriately sized stairwells and corridors were observed. If too narrow, these are potential safety hazards and impede efficient traffic flow in the building; if too wide, and this was more often the case, they preempt costly space that could be used for other purposes.

Often, the same corridor width was used with both single loaded and double loaded corridors within the same building. This appears to be inconsistent since it means that either the width is too narrow for double loaded corridors or too wide for single loaded ones. Ocassionally, completely unloaded corridors were observed. There seems to be no justification for this.

The same situation occurred in the case of stairwells, where often the size needed to handle the traffic flow in the heavily traveled sections of the buildings was repeated in more remote sections of the building where smaller widths would have safety and effectively handled the traffic flow. Again, there was valuable space wasted. With proper planning and careful study of the expected traffic flow in the contemplated design, such mistakes could be avoided, thus saving money.

Excessively elaborate entrance foyers and lobbies: Aesthetic rather than functional considerations appeared to have been primary in the design of these areas. Fish ponds, spraying fountains, chandeliers, mosaic tile murals, planters and the like were observed in many of the buildings surveyed. The significance of these things to the educational program conducted within the building is certainly questionable. Money

DOOR UNITS WHICH COULD BE ELIMINATED

CLASSROOM AND HALLWAY DOORS

spent for the aesthetic dressing of these areas could have been saved or used in places where a significant contribution to the instructional program was assured. (Page 23 illustrates these features.)

Another observation noted during the survey concerning these areas was that often they were too large and profligate of costly space. In several of the buildings observed, these areas served multiple functions--as entrance lobbies, student commons area, auditorium and gymnasium lobbies. In these buildings the use of the large spaces could be justified. However, in many cases this was not true. The entrance foyers and lobbies were purely that and nothing more. Consequently, many times valuable space was purchased, but not effectively used. (Page 24 illustrates large open spaces found in several schools.)

Finally, in many cases there was an excess of doors leading from the outside. The cost of the types of modular door and window units usually used is great, where more than a sufficient number were installed.

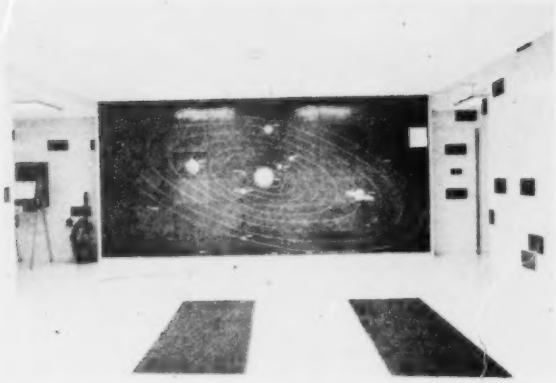
Wood beam ceilings: In several of the buildings visited, massive laminated wood beams were used as structural supports, generally in certain special areas, chiefly libraries and multipurpose rooms. This seems to be unjustified in terms of cost. While aesthetically attractive, these beams are certainly no more functional than other less expensive materials which could have served the same structural purpose and still have been aesthetically pleasing (page 31).

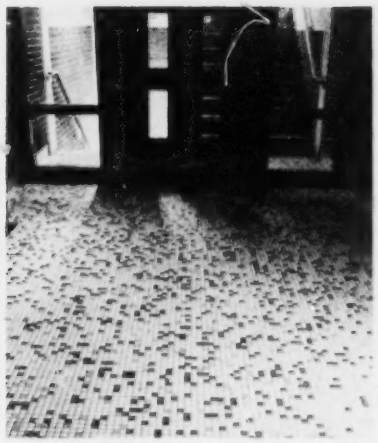
Inappropriate flooring material: In this area, again, low initial cost seems to exert too strong an influence upon selection decisions. Asphalt and vinyl asbestos tile floors are initially inexpensive to install in comparison with terrazzo or carpet. Nevertheless, in the overall life of a building, the latter types of floor coverings will be less expensive than the former because of lesser maintenance costs. The shoe scuffing of synthetic soles of one kind or another does not permit the maintenance of a high attractiveness level on mastic floors.

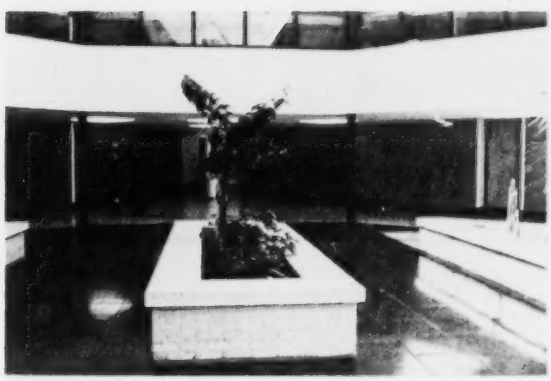
The results of the survey suggest that carpeting is the most satisfactory flooring material for most areas of a building, especially classrooms and corridors in the academic areas. Again, while it may be initially more expensive to install than other types of flooring material, the differential is mostly offset by reduced maintenance costs over the years of use.

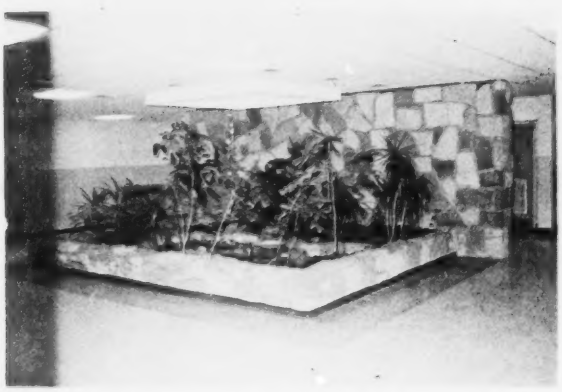
In addition to this purely financial consideration, carpet has other positive features which make it an excellent choice. Primary among these is its effectiveness as an acoustical treatment. Because of this, its use in a building, along with proper planning, obviates the need for classroom doors and other costly acoustical treatment, thereby effecting a significant cost savings. Further, especially but not only in elementary schools, the installation of carpeting in the classrooms adds another dimension to the learning environment--it allows the floor to be used as a comfortable, quite

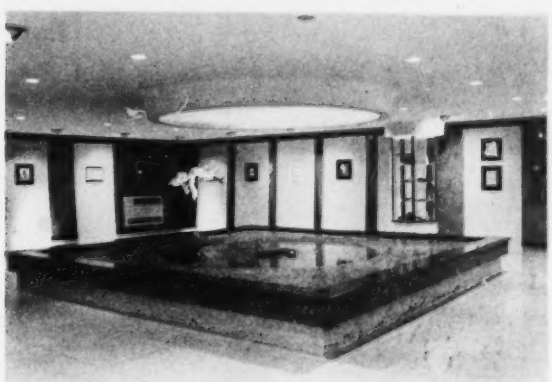
DECORATIVE INTERIOR FEATURES





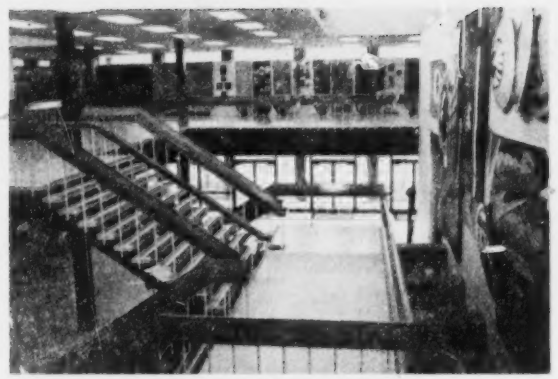


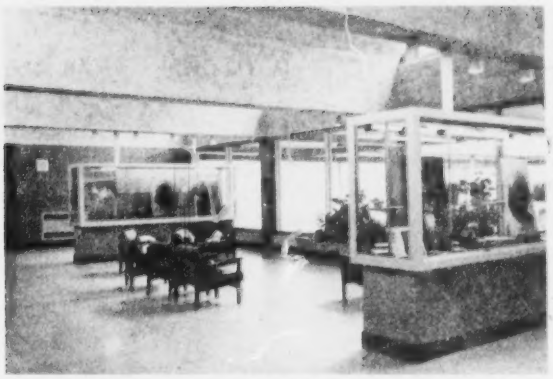


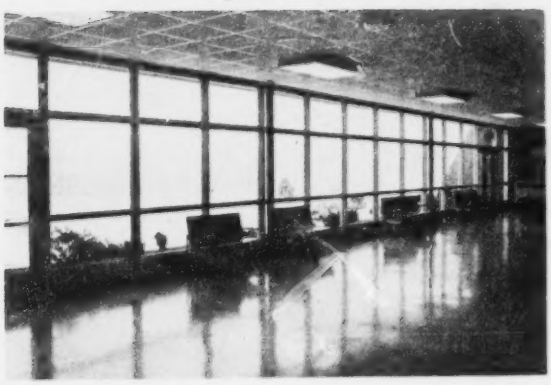


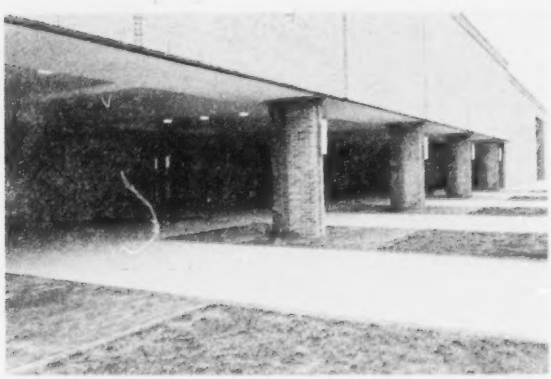
PLANTERS, FISHPOND, FOUNTAIN, DECORATIVE FLOOR AND WALL DESIGNS

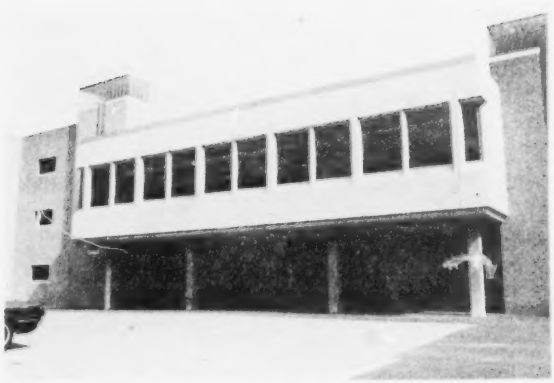
LARGE OPEN SPACES











DEEPLY RECESSED DOORWAYS, OVERSIZED CORRIDORS, STAIRWAYS AND LOBBIES

useful learning surface. Overall, the great majority of school people interviewed felt that carpeting makes a psychologically significant contribution to the creation of a proper learning environment. While all recognized the perception of carpeting as a "luxury" by most lay people, they recommended its use.

Inappropriate wall materials: A basic and often repeated mistake observed during the survey was inappropriate selection of wall materials. Often, a low initial cost, rather than long-term cost, seemed to be the major factor influencing decisions in this area.

Flat latex paint, for example, is initially cheaper than epoxy paint. However, latex-covered walls require more maintenance and must be repainted more often than epoxy-covered walls in order to maintain the same level of attractiveness. Over the presumed 50-year life span of a school building, this differential cost would make epoxy cheaper.

The same rationale can be applied to concrete block vs. cavity walls. Concrete block, while initially more expensive, is easier to maintain and consequently more economical over the full life of the building. When painted with epoxy, concrete blocks are durable, easily maintained and attractive. On the other hand, cavity walls, whether covered with vinyl or painted plaster, are not as durable and where student control is a problem, can be more easily damaged by vandals. They require more maintenance and thus are more costly over the long term. Additionally, cavity walls are not as effective as sound barriers, an important consideration in school facilities.

While selection of initially cheap but eventually expensive wall materials was the most frequently noted occurrence, another major observation in this area concerned the selection of materials which were not cost justifiable. Brick, for instance, makes a durable, easily maintained and attractive wall covering. However, it is more expensive than epoxy-covered concrete block which has the same qualities. So its use as interior walls can be questioned in terms of cost.

Walnut, maple, oak and other types of wood paneling are also attractive wall coverings. However, for a number of reasons, these materials are initially more expensive than epoxy-painted concrete block and are not as durable or as easily maintained. Again, paneling as a wall covering in a school building does not appear to be justifiable on a cost basis.

Unnecessary safes: In many of the schools visited, expensive security vault doors were observed in the office complex. These seem to represent an unwarranted expense for two basic reasons.

First, it seems imprudent for a school to keep on hand that amount of cash or other valuables which this type of security vault is necessary to protect. Prudent planning would make any loss from theft or vandalism minimal and eliminate the need for a costly safe or security vault.

Further, in the majority of schools where such sophisticated and expensive doors were observed, they did not offer any but psychological protection from theft because they were mounted in the normally constructed building walls. In most cases, these were concrete block or plaster covered cavity walls. Thus, the doors could easily be bypassed by anyone intent upon entering the vault areas. Again, the expensive doors seem unjustified.

Decorative, functionally useless outside fixtures: The survey has shown that, too often, significant sums of money have been spent to construct functionally useless, purely aesthetic outside features which add little or nothing to the educational program of the school and create costly maintenance problem (page 27).

The visitation team observed such things as graded, grass-covered mounds in front of buildings, massive precast concrete benches and balconies, free-standing brick walls, terraces, elaborate decorative lighting, decorative cedar shake facades and so on (page 28).

Aesthetically, these features are attractive and probably contribute to the artistic taste of the students of the school concerned. However, when this contribution is weighed against the expense of such features, both in terms of initial cost and life-time maintenance cost, their desirability is questionable. It would appear that the money involved could be better spent elsewhere.

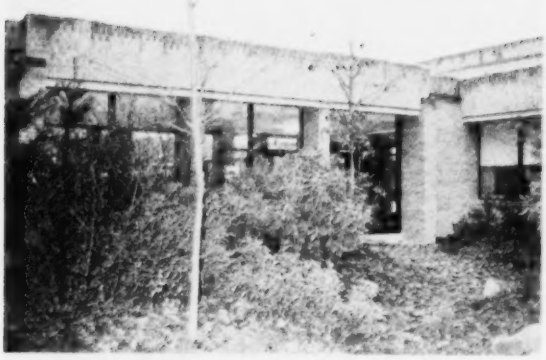
Health suite: The survey indicated that health suites, especially in elementary schools, are often larger than they need be. A possible reason for this, apparently, is that they are designed and constructed in such a way that the necessary distance for eye vision tests is included in the room. This is unnecessary, since there are other areas in the building where vision tests could easily be conducted.

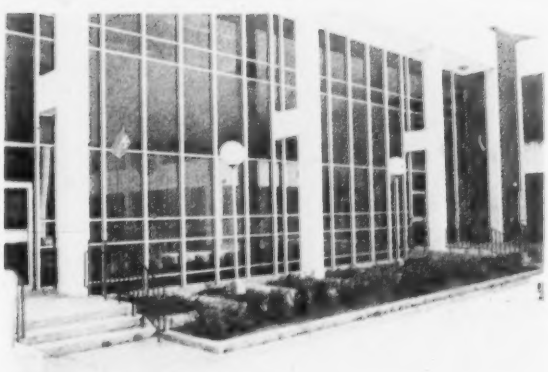
There is no need to design an area for occasional periods of heavy use and normally the health suite is not heavily used. Its size could easily be reduced in many schools without in any way impairing the work of the nurse or adversely affecting the quality of the educational program.

Sun shades above windows: In most instances where sun shades above the outside of windows were observed during the survey, they were ineffective. It appeared, again, that the purpose of these was more a decorative than functional one since none protruded far enough from the building to shield much of the room inside from the sun's rays. Further, the type of material used in their construction, such as precast concrete, pebble block, cedar shakes, etc., made them a potentially costly maintenance problem (page 30).

If windows are necessary, it would appear to be more economical and much more effective to screen the sun through the use of tinted window glass

EXAMPLES OF UNUSUAL EXTERIOR DESIGN





EXIT DOORS, ARCHWAY, COURTYARD, WALKWAY, IRREGULAR CONFIGURATIONS

MOUNDS, PLANTERS, FREE-STANDING BRICK WALLS AND RETAINING WALLS

Unnecessarily Expensive Construction Techniques

In several of the schools visited during the survey, unjustifiably expensive construction techniques were seen to have been used. For instance, in several schools prepainted concrete blocks were used for corridor and classroom walls. The care in handling during transit and the skill and care required to construct a wall with these is greater than that required to construct a wall using unfinished blocks. The attendant cost of such a construction technique is probably greater than that of putting up unfinished blocks and then painting them with a finish of equal quality. Further, the attractiveness level of the two types of wall is equivalent. There appears to be no sound reason for using prefinished blocks.

Another technique which appears to be unwarranted on a cost basis is the use of a stacked-bond layup of brick or concrete block as opposed to a running bond layup. The stacked-bond method calls for more precise workmanship and is therefore more costly than the running bond technique. The slight difference in the attractiveness level of the results of the two techniques does not appear to be justification for any extra cost.

These and other examples that could be given point to an apt generalization. That is, where alternative construction techniques are available and all make essentially the same contribution to the educational program, the least expensive technique should be used. As mentioned, this was not the case in several of the buildings surveyed. (Miscellaneous features are illustrated on page 31.)

Less Than Possible Compactness of Building

Technological innovations, especially in the design of such mechanical services as lighting, heating and cooling and ventilation make it possible to design much more compact school buildings now than in the past. This compactness makes possible reductions in such building elements as footings, peripheral walls, fenestration, roof areas and land occupancy areas. This reduction results in possibilities for significant cost savings.

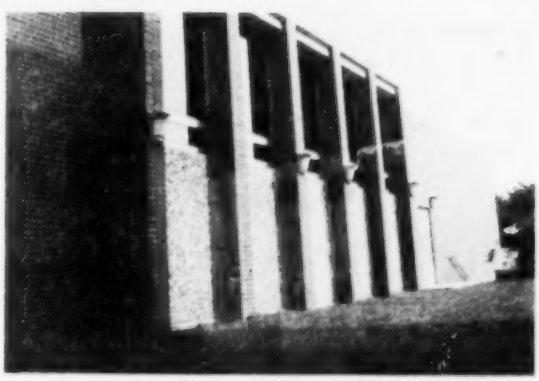
These possibilities, however, were not fully realized in most of the buildings observed during the survey since most were approved under earlier regulations.

Excessively Expensive Doors, Hardware, Fixtures, Etc.

In a large number of the schools visited, unnecessary and/or unnecessarily elaborate doors and door hardware was observed. While it is important to purchase fixtures and equipment that is durable and long lasting, it is important to secure these things beyond what is reasonably necessary.

Often classroom wardrobes and closets were equipped with expensive, double-hung, simultaneously operating doors where a curtain would have

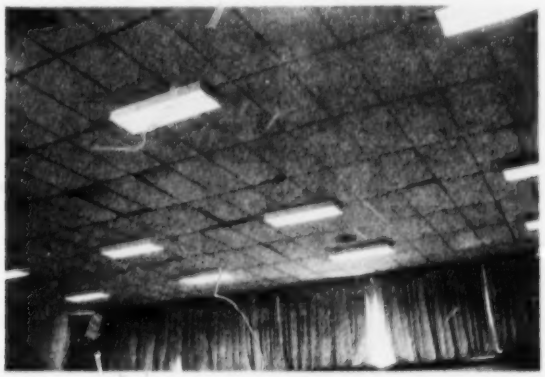
NONESSENTIAL EXTERIOR TREATMENTS



SUN SHADES, WALL DECORATIONS, AND DECORATIVE STRUCTURAL DESIGNS

## MISCELLANEOUS FEATURES

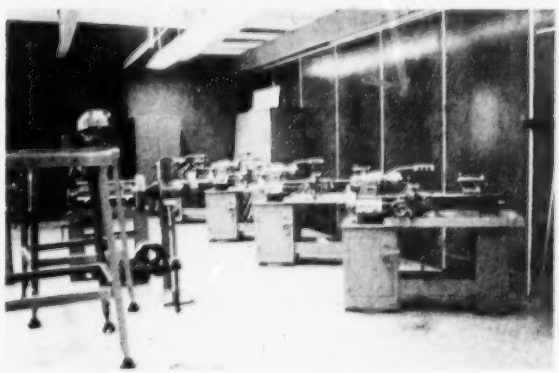
INAPPROPRIATE CEILING MATERIAL IN MULTIPURPOSE ROOM



UNUSABLE WALL SPACE IN LIBRARY

LEAKING ROOF

INAPPROPRIATE USE OF FOLDING PARTITION



INAPPROPRIATE CEILING AND STRUCTURAL MATERIAL

UNNECESSARY DOOR

been equally effective since the doors were rarely closed. Many buildings had elaborate classroom entrances consisting of a modular unit with doors, door frame, vision panels, etc., which went beyond simple functionality.

One school visited had massive brass door knobs and fixtures throughout the building. This was patently unnecessary and represented an unnecessary overcost. Prudent purchases of standard, durable, functional, nonelaborate door units, hardware and fixtures could insure a significant cost savings.

Bronze door and wall attached catches to hold doors open were observed in the same buildings where mechanical door closers were also installed on most of the doors. Neither device was necessary or desirable, yet the repetition with which they occurred, in just a single building, signalled a significant but useless expenditure.

Suggested Additions at Reasonable Costs

Principals and teachers were requested to give ideas on how the building could have been made more functional by changes or added facilities without excessive costs.

Responses indicated a significant desire to universal carpeting, additional small classrooms, small conference rooms, more electrical outlets and more storage space. Elementary teachers and principals would add a separate lunch room to free the multipurpose room for physical education and other activities.

Design Communications

A major complaint emphasized in this area of the interviews was a strong feeling that the group concerned with planning new school buildings should include a wide variety of people, such as teachers, administrators, board members, parents, students and representatives from community groups. These groups are intimately involved with the use of the building after its construction and should, therefore, be intimately involved in the planning of the facility.

In almost all cases, the representatives of the teaching staffs interviewed expressed a strong desire to be involved in the planning of new buildings in a meaningful way. They generally felt that they should be involved in the actual decision making process, not just be asked to submit ideas in the form of sketches and plans to be ruled upon by others. They wanted, as many said during the interviews, to be involved in more than a tokenistic manner.

Another often mentioned idea elicited during the interviews concerned the appropriate relationship of the architect and the other planners. The architect should be, according to the majority of the school people interviewed, a facilitator as well as an initiator of ideas. He should strive, within the limits of costs and practicability, to give the school people what they want rather than tell them why they can't have it, as

was often the case with the buildings surveyed. Also, the people interviewed, especially teachers, believed that there should be extensive face-to-face meetings with the architect, rather than just a passing of documentation in the form of sketches, models, drawings, floor plans and the like. While most interviewees did stress the importance of such documentation, they believed it less than optimally useful unless it was accompanied by personal communication between the architect and the planners.

In short, there was a general concensus that the planning process should involve, in a meaningful way, representatives of all affected parties, should be extensively documented, and should cast the architect in the role of a facilitator who communicates extensively with the school planners.

Multipurpose Areas

Secondary school auditoriums, when used for the intended purposes, were considered most satisfactory. When auditoriums with seats without study tops were used for study halls they were considered less than satisfactory. When used for music rooms they were also considered less than satisfactory. Some principals felt auditoriums were too small when they could not accommodate the entire student body at one time. Others indicated small auditoriums served the purpose when built for two grade levels.

Gymnasiums were less than satisfactory when scheduling intramurals and when made up of too few stations.

Cafeterias were rated as less than satisfactory for large group instruction.

Large group instruction rooms were most satisfactory for intended purposes.

Multipurpose rooms in elementary schools received the largest number of least satisfactory ratings. The combination gymnasium, cafeteria and assembly room was least satisfactory. The greatest problem was that of scheduling gym classes around the lunch period in these combination facilities.

Room Schedule Practices

Secondary principals were requested to list rooms with less than full utilization. Classrooms were to include English, science, social science and mathematics. In addition, at least one classroom from either industrial arts, music, home economics, physical education or art was to be listed. In the 10 junior high schools surveyed, there was 100 per cent utilization of classrooms by periods except for those classrooms shown in Table I. In the 10 senior high schools there was 100 per cent utilization of classrooms by periods except for those classrooms shown in Table II.

TABLE I

ROOMS WITH LESS THAN
100 PER CENT UTILIAZATION

JUNIOR HIGH

Range of Per Cent Space Utilization by Subject Field

| Subject | N | Low | Middle | High |
|---|---|---|---|---|
| Science | 12 | 62 | 84 | 97 |
| English | 8 | 72 | 84 | 97 |
| Social Studies | 9 | 72 | 86 | 94 |
| Mathematics | 8 | 72 | 88 | 97 |
| Industrial Arts | 4 | 58 | 82 | 89 |
| Home Economics | 8 | 71 | 86 | 89 |
| Physical Education | 2 | 83 | 84 | 86 |
| Music | 7 | 71 | 84 | 83 |
| Art | 7 | 71 | 83 | 86 |
| Reading | 2 | 74 | 80 | 85 |

In the junior high school, industrial arts had the lowest utilization percentage, 58 per cent, with science next, 62 per cent.

TABLE II

ROOMS WITH LESS THAN
100 PER CENT UTILIZATION

SENIOR HIGH

Range of Per Cent Space Utilization by Subject Field

| Subject | N | Low | Middle | High |
|---|---|---|---|---|
| Science | 17 | 49 | 84 | 94 |
| English | 12 | 69 | 80 | 88 |
| Social Studies | 7 | 73 | 86 | 91 |
| Mathematics | 9 | 75 | 86 | 94 |
| Industrial Arts | 5 | 70 | 75 | 86 |
| Physical Education | 4 | 70 | 82 | 89 |
| Business | 3 | 57 | 74 | 90 |
| Business Typing | 3 | 58 | 72 | 86 |
| Music | 7 | 15 | 77 | 88 |
| Art | 6 | 57 | 83 | 88 |

In the senior high school, a music room with 15 per cent utilization was the lowest. A science room with 49 per cent was next, with art and business education each at 57 per cent.

Class Size of Selected Subject Areas

Principals were requested to list the number of pupils per period for each day by subject areas.

In junior high schools, the average size of classes for social science, English, mathematics, science, art and home economics were:

TABLE III

Junior High Schools
Class Size

| Subject | Number of Schools | Range of Average Number of Pupils Per Period |
|---|---|---|
| Social Science | 7 | 27 - 32 |
| English | 7 | 27 - 32 |
| Mathematics | 7 | 22 - 32 |
| Science | 7 | 23 - 33 |
| Art | 7 | 28 - 32 |
| Home Economics | 7 | 15 - 16 |

TABLE IV

Middle Schools
Class Size

| Subject | Number of Schools | Range of Average Number of Pupils Per Period |
|---|---|---|
| Social Science | 4 | 27 - 33 |
| English | 4 | 26 - 32 |
| Mathematics | 4 | 27 - 35 |
| Science | 4 | 15 - 36 |

Middle schools reported class size for social science, English, mathematics and science.

TABLE V

Senior High Schools
Class Size

| Subject | Number of Schools | Range of Average Number of Pupils Per Period |
|---|---|---|
| Social Science | 7 | 21 - 36 |
| English | 7 | 18 - 29 |
| Mathematics | 7 | 19 - 29 |
| Science | 7 | 16 - 36 |
| Art | 2 | 21 - 21 |

Senior high schools reported class size for social science, English, mathematics, science and art.

TABLE VI

Elementary Schools
Class Size

| Grade | Number of Schools | Range of Average Number of Pupils Per Period |
|---|---|---|
| 1 | 4 | 20 - 35 |
| 2 | 5 | 22 - 29 |
| 3 | 4 | 23 - 28 |
| 4 | 6 | 28 - 36 |
| 5 | 6 | 27 - 35 |

Elementary schools reported class size by grade level.

The tables indicate a considerable range in the average number of pupils in some subject areas and schools. The number of pupils some classroom teachers meet are considerably higher than the average pupil-teacher ratio.

## DEFINITION OF TERMS

Approved Room Schedule

A complete listing of all discrete areas contained within a building classified according to use, number and size for reimbursable or nonreimbursable purposes.

Architectural Area

Includes all areas within an edifice and enclosed by the walls of the building.

Educational Specifications

A description of the educational program to be offered, instructional grouping patterns, schedule characteristics, anticipated instructional procedures, relationships to exist among program segments and any unique practices to be accommodated in a planned educational facility. Required by the Pennsylvania State Board of Education regulations, these may be prepared by district people and submitted to the Division of Physical Plant and Construction for approval.

Instructional Space Allocations

Those areas of a school building in which instructional activities are normally conducted. Herein, it refers to such spaces as general classrooms, language labs, libraries, instructional materials centers, industrial arts areas, science rooms, business rooms, swimming pools, auditoriums, large group instruction areas, etc.

Long-Range Developmental Plans

Plans are required by the Department of Education before a school building may be considered for approval. The plans are generally a past history of the school district and a 10-year projection into the future, with reassessment and updating each two years from the date of the original.

Multipurpose Room

A multipurpose room is a room specifically designed or adapted for two or more of the combined functions that might normally be served by a separate library, separate audio-visual room, separate auditorium, separate gymnasium or separate cafeteria, such as assemblies, physical education classes, lunch, music, clubs, audio-visual work and library services.

Noninstructional Space Allocations

Used herein to denote buildings or sections of buildings which have been constructed to facilitate open classroom instruction. Usually, it is physically expressed in large open areas in which several normal

class-size groups can work, either separately or together. Often these areas can be delineated, through the use of folding partitions, as individual classrooms if desired.

Rated Pupil Capacity

It is the figure assigned by the Department of Education for reimbursement purposes. It is computed after the capacity for all classrooms or teaching stations have been determined with the use of schedules prepared by the Division of Physical Plant and Construction.

Reimbursable Instructional Spaces

Those spaces recognized by the state as being eligible for reimbursement.

Scheduled Area

It is the total net space of the building in classrooms and in all other areas used for education, health, administration and social purposes, such as offices, cafeterias, gymnasiums, locker rooms, etc. The assigned figure for each project is determined by the Division of Physical Plant and Construction.

Total Project Cost

It includes all costs involved in a project of a school facility such as structure costs, the architect's fee, movable fixtures and equipment, site costs, additional costs, legal counsel fees, advertising and sewage.

Unloaded Corridors

Corridors without rooms on either side.

APPENDIX A

REIMBURSABLE CAPACITY OF SCHOOL BUILDINGS REVISED*

Elementary Buildings

Elementary buildings are evaluated as follows:

| | Reimbursable Capacity |
|---|---|
| Classrooms, art, music, special education and large group areas | 35 |

Secondary Buildings

| Teaching Stations | Reimbursable Capacity |
|---|---|
| Classroom 660 sq. ft. and over | 35 |
| Language Laboratory | 35 |
| Science Laboratory | 24 |
| Student Project Room (220 sq. ft.) | 9 |
| Business Classroom | 35 |
| Typing | 24 |
| Office Practice | 24 |
| Art Room | 24 |
| Gymnasium (each teaching station) | 40 |
| Homemaking (each teaching station) | 24 |
| Shop (each teaching station) | 24 |
| Band Room | 24 |
| Music Classroom | 35 |
| Large Group Instruction Area | 40 |
| Planetarium | 30 |
| Observatory | 15 |
| Instrumentation-Library Classroom | 35 |
| Drafting | 35 |

Utilization factor--85 per cent. All secondary areas are considered as having 85 per cent full-time use.

The total reimbursable capacity equals 85 per cent of the sum of the reimbursable capacity of all teaching stations.

Swimming pools are reimbursed as follows: elementary receives 35 reimbursable points, secondary receives 40 reimbursable points, but the 85 per cent factor results in a net of 34 points.

*Source: Bureau of Educational Administration and Management Support Services, Division of Physical Plant and Construction.

APPENDIX B

PEOPLE EXERTING MOST INFLUENCE
UPON BUILDING DECISIONS

| Types of Building Decisions | Chief School Administrator | Educational Consultant | School Board Member | Architect | Teacher | Others |
|---|---|---|---|---|---|---|
| Type of Building (one of multiple story) | 17 | 1 | 10 | 22 | 0 | 1 |
| Type of roof (flat or peaked) | 0 | 0 | 2 | 42 | 0 | 1 |
| Single or Multiple building | 12 | 1 | 2 | 24 | 0 | 1 |
| Type of heating system (oil, gas, electricity) | 4 | 0 | 33 | 10 | 0 | 1 |
| Type of classroom floors (carpeting, tile, etc.) | 17 | 1 | 25 | 11 | 0 | 2 |
| Type of hallway floors | 21 | 1 | 20 | 14 | 0 | 1 |
| Type of hallway wall/material | 16 | 0 | 11 | 23 | 1 | 1 |
| Type of frame (modular or custom) | 2 | 1 | 2 | 41 | 0 | 0 |
| Type of brick (regular or custom) | 1 | 0 | 21 | 28 | 0 | 0 |
| To use or not use air conditioning | 26 | 0 | 19 | 6 | 0 | 3 |
| To build or not build a bus canopy | 9 | 1 | 8 | 23 | 0 | 0 |
| Size of parking lot | 15 | 1 | 15 | 22 | 1 | 0 |

APPENDIX C

## Less Satisfactory Areas

| | Number of Cases Cited |
|---|---|
| **Roofs and Walls** | |
| 1. Leaky roofs, flashings, windows | 17 |
| 2. Leaky walls | 1 |
| 3. Cracked wall structure | 1 |
| **Windows** | |
| 1. Excessive fenestration and heat penetration | 18 |
| 2. Inoperable windows | 1 |
| 3. Wrong window blinds | 1 |
| **Site** | |
| 1. Poor site drainage | 5 |
| 2. Playground area too small | 5 |
| 3. Insufficient parking space for staff | 4 |
| 4. Poor site selection | 4 |
| 5. Sloping parking and play areas | 3 |
| 6. Site too small | 1 |
| 7. Playground area traveled by delivery trucks and buses | 1 |
| **Mechanical Areas** | |
| 1. Lack of total climate control or poorly working climate control | 12 |
| 2. Poor ventailation of locker rooms and home economics area | 12 |
| 3. Noisy air conditioning units or ventilators | 9 |
| 4. Insufficient electrical outlets in classrooms | 7 |
| 5. Incinerator stack poorly located and too short | 5 |
| 6. Coil doors or folding doors in auditorium not working properly | 4 |
| 7. Lack of total air conditioning | 4 |
| 8. Faulty installation of heating pipes | 3 |
| 9. Faulty thermostats | 2 |
| 10. Lack of floor drains in locker and toilet rooms | 2 |
| 11. Dust from ventilators | 1 |
| 12. No water tap in interior courtyard | 1 |
| 13. Poor location of pool filter | 1 |
| 14. Lack of an intercom system | 1 |
| 15. Swimming pool lower than the drain pipe | 1 |
| 16. Skylights in classrooms cause problems | 1 |
| 17. Use of a curtain as a wall divider between an elementary gymnasium and cafeteria | 1 |

| | Number of Cases Cited |
|---|---|
| **Floor Materials** | |
| 1. Vinyl and asphalt floors are expensive and hard to maintain | 8 |
| 2. Cheap grades of carpet and nylon carpet cause static electricity | 4 |
| 3. Bad terrazzo | 2 |
| 4. Bad epoxy floors | 2 |
| 5. Carpet should not be used in an art room | 2 |
| 6. Avoid gold colored carpet, hard to maintain | 2 |
| 7. Bad mastic tile floor | 1 |
| 8. Use of rubber Beltrite floor not recommended for a gymnasium | 1 |
| 9. Pebbled concrete should not be used | 1 |
| **Wall Materials** | |
| The use of wall covering material in corridors such as plaster, vermiculite plaster and latex paint were all cited as being less than satisfactory. | 15 |
| **Instructional Areas** | |
| 1. Poor location of rooms such as library, offices, multipurpose rooms, boys shower rooms on second floor | 17 |
| 2. Lack of specially designed art and music facilities, especially in elementary schools | 15 |
| 3. Auditoriums too small | 6 |
| 4. Lack of sufficient small instructional rooms | 5 |
| 5. The following rooms were too small or were needed | |
| a. Cafeterias and kitchens | 4 |
| b. Library | 3 |
| c. Multipurpose rooms, elementary | 3 |
| d. Shower and locker rooms | 2 |
| e. Industrial arts | 1 |
| 6. Classrooms too small | 1 |
| 7. No greenhouse | 1 |
| 8. Language laboratory too large | 1 |
| 9. A combined art and science room worked out poorly | 1 |
| **Noninstructional Areas** | |
| 1. Lack of storage space in classrooms and for large gymnasium equipment in the gym area | 14 |

| | Number of Cases Cited |
|---|---|
| **Noninstructional Areas** (continued) | |
| 2. Inadequate or nonexistent faculty lounges | 7 |
| 3. Lack of lobby or commons room for students | 5 |
| 4. No passenger elevator | 3 |
| 5. Scheduling problems in multipurpose spaces | 3 |
| 6. Inadequate spectator space in pool and gym areas | 2 |
| 7. Lack of separate locker rooms for pool area | 1 |
| 8. Lack of dressing room in stage area | 1 |
| 9. Poor sewage disposal system | 1 |
| **Building Design** | |
| 1. Student lockers too small (6" type) | 4 |
| 2. Lack of display space and poor chalkboard | 3 |
| 3. Lack of toilets adjacent to outside play areas or cafeteria | 3 |
| 4. Poor auditorium seating | 2 |
| 5. Lack of a main entrance area | 2 |
| 6. Lack of movable walls | 2 |
| 7. Low corridor ceilings | 1 |
| 8. Poorly designed large group instruction room | 1 |
| **Acoustics** | |
| 1. Poor acoustics generally throughout the school | 8 |
| 2. Noise penetration into classrooms | 8 |
| 3. Folding doors between classrooms with poor sound barriers | 2 |

APPENDIX D

## Possible Areas of Economy Observed by the Evaluators

| | Number of Cases Cited |
|---|---|
| Bus Canopy | 19 |
| Marble Window Sills | 4 |
| Hardwood Stage | 5 |
| Excess Fenestration | 27 |
| Unnecessary Classroom Doors | 24 |
| Inappropriate Flooring Material | 9 |
| TV Cable in Conduits | 2 |
| Inappropriate (or expensive) Wall Material | 14 |
| Decorative and Useless Window Coping and Sun Shades or Screens | 9 |
| Excessively Elaborate Foyers, Lobbies, Entrances, Exits, Etc. | 18 |
| Window Walls in Library | 3 |
| Inordinately Large Health Suite | 2 |
| Excessively Expensive Doors, Hardware, Closet Space, Alcoves, Etc. Within Classrooms and Other Areas | 14 |
| Wood Beam Ceilings (libraries and multipurpose rooms excludes schools utilizing wood structures throughout) | 4 |
| Inappropriate Integration of Building and Site | 6 |
| Less than Possible Compactness of Building | 13 |
| Functionally Useless Outside Fixtures | 13 |
| Light Console on Stage | 2 |
| Unnecessarily Expensive Construction Techniques | 11 |
| Too many Boilers | 7 |
| Excessively Large Stairwells, Corridors | 13 |

APPENDIX E

Observer Reactions to Two Senior High School Buildings

The following comments are offered as evidence that careful planning and creative ideas of local administrators and school board members could result in a very efficient, flexible, economical and excellent learning situation.

School No. 1

The academic areas of the school were built in a circular pod arrangement, with the centers of two of the pods serving as large group instruction areas and the third as a library. The auditorium, gymnasium and swimming pool project outward from the pod complex in a straight line; these are flanked on the one side by the cafeteria kitchen and industrial arts shops, on the other by art, special education and music. Although formal balance might have been achieved by opting for a fourth circular pod, one equal in size to the others would not have been large enough to accommodate the needed activities.

Perhaps, the most innovative feature of the building was the "commons area" which was built between the pods and the entrance to the auditorium. This area served a multiplicity of activities ranging through cafeteria, recreation area, place for large group instruction and/or independent study and as a social gathering area during intermissions from auditorium productions.

The entire academic area of the building was carpeted, which resulted in excellent acoustical conditions; in fact, in designing the building deliberate attention was given to all acoustical factors so that a quiet, pleasing atmosphere could prevail. For this reason, it was possible to eliminate classroom doors throughout the academic wing.

It was found that a lack of classroom doors had no adverse effect upon the educational program; moreover, it resulted in an approximate savings of $250 per door initially, which could be as much as $750 per unit over the life of the bond issue.

Observation revealed that the flexible design of the school, with its large and small group instruction areas, made it admirably suited to the program of modular scheduling under which the educational program is offered. In retrospect, the administrators recognize that more small classrooms of 425 square foot area would have made scheduling easier, because many groups meet with as few as 15 to 18 students. Nevertheless, they were not unhappy and they were especially pleased with the amount of storage space available.

The stage floor in the auditorium was of soft wood; this should be required as a stage material for all schools, because it makes possible the erection of scenery and sets. This type floor--douglass fir or yellow pine is less expensive than oak or maple; it accepts fasteners such as nails or screws better than the hard woods; it may never have to be replaced, but if it does, it is not a serious problem.

The 575 seat auditorium is sufficient for the size of the school. The principal remarked that he scheduled different types of assembly periods for the various grades so that a larger one is unnecessary.

The building poses sharp lines; the exterior walls are of fractured concrete brick and present an appearance of cleanliness. Although innovative in design, it was less expensive than the traditional "egg-crate" school. The total project cost per pupil, with a rated capacity of 1,155, was $3,810 in contrast with a traditional type building having a rated capacity of 788 students. The latter was built in the same county one year earlier, when prices were lower, at a per pupil cost of $4,105. Undoubtedly, a number of factors contributed to the higher cost of the more traditional school, but three in particular need to be cited. School number one had a quite regular geometric configuration; it had much less fenestration, it had epoxy painted concrete block walls rather than brick for interior partitions.

School No. 2

The following comments describes a school with poor planning.

The academic areas of this school were built in the traditional room-after-room arrangement, strung out along corridors. Seemingly, an attempt was made to harmonize space orientation, so that compatible activities were grouped. However, there were evidences that some activities interferred with others.

The best that could be said for the building was the fact that it was new; despite its shortcomings, it was better than that which had been abandoned. However, there was so much more that might have been had for the same amount of expenditure that the school district was short changed.

Acoustical treatment of the building was exceptionally poor throughout. In the cafeteria, designed for 250 capacity, the noise factor was intolerable. The auditorium, alone, seemed to be the only place where acoustical treatment was taken into consideration, but here other problems equally as serious were manifest.

The auditorium was designed for 1400 persons, or almost twice the rated student capacity. It was divisible into two large areas. The major problem with the auditorium, however, was the leaking roof; the difficulty of protecting the interior and seating, and at the same time locating the leak.

The building was only partially air conditioned--offices and auditorium--so was unbearably hot in early fall and late spring because of the large amount of window area. Mechanical heating, too, was a problem because of improper installation of the heating pipes and returns. Expansion was not allowed for in the design, and the pipes were breaking at the joints. This condition necessitated the shutting off of univents, so inadequate ventilation resulted. Ventilation in the shower rooms was literally nonexistent; therefore, a serious water condition prevailed. Efflorescence of interior brick walls is a rarity, but school number 2 was the exception.

It is unfortunate that a school building should be located on a poor site when good sites are available; it is unfortunate that long expensive access roads must be build when that money might be used for something more contributory to the education of youth; it is unfortunate when good structural materials are incorporated in a building that is poorly designed. The building becomes a monument to ineptness; it becomes an expensive and functionally less than adequate facility for the user.

## OBSERVATIONS AND RECOMMENDATIONS

### Acoustical Treatment

1. Satisfactory sound control is technically possible in all areas of the school. Design neglect of acoustical principles should no longer be tolerated, especially in gymnasiums, auditoriums and cafeterias. One very effective and relatively inexpensive way of acoustically treating band and music rooms is to carpet the walls with an inexpensive grade of carpeting for certain conditions.

2. Proper design and acoustical treatment of school buildings would permit the elimination of many infrequently used classroom doors, thereby effecting a significant savings. This elimination should become a goal of building planners except where security requires doors.

### Ceiling and Lighting

1. Ceiling heights in many areas of modern buildings could be lowered, reducing building cubage and possibly saving money, without impairing the effectiveness of the educational program.

2. The quality of artificial light, now possible, obviates the need for the vast amount of window area heretofore required. Thus, the amount of fenestration in school buildings can and should be greatly reduced. The present required minimum of 10 square feet of windows, when adhered to, results in a great reduction in solar heat and sun glare.

3. Rather than continue to simply increase candlepower as a way of improving the lighting of the classroom environment, more attention should be given to controlling quality of light.

4. Suspended ceilings with loose panels are inappropriate in multi-purpose rooms where physical education activities are conducted. Even with the required 18-foot ceiling height, thrown or batted balls can easily damage and even dislodge the panels. Thus, this type of ceiling treatment is impractical and expensive from a maintenance standpoint and, worse, can be dangerous from a safety standpoint. Open structural support construction would be sufficient. This or some other method of acoustical treatment should be used in these areas.

5. The installation of emergency lights in interior, windowless rooms is necessary to prevent panic in cases of power failure.

6. Sufficient outside lighting for parking and play areas should be provided for each school according to the neighborhood problems and the use of the buildings.

Design

1. There should be no completely unloaded (no rooms on either side) corridor in a school building except for very short, connecting ones.

2. More attention should be given during the planning process to the elimination of excessively wide and excessively narrow corridors and stairways in schools. Savings can be effected without sacrificing safety if attention is given to traffic flow patterns in the planning.

3. More detailed and extensive planning of location of discrete areas within a school building should be carried out in the future. The survey results indicated that a great many mistakes have been made. Libraries have been located on the opposite side of buildings from classroom areas, lavatory entrances have been placed directly across corridors from classroom entrances and noisy areas have been constructed adjacent to areas where quiet is necessary. A comprehensive consideration of the anticipated instructional program in light of its implications for location of discrete areas within the building should eliminate this type of problem, making more efficient buildings a reality.

4. All toilet rooms should be tiled and constructed with wall hung fixtures, floor drains and a conveniently located sillcock for a hose in order to facilitate cleaning. Floors could then be hosed down and quickly squeegeed with none of the attendant bother and expense entailed by the normal mopping procedures.

5. Individual classroom toilets, while appropriate in kindergarten and primary classrooms, are not necessary and should not be installed in intermediate classrooms. They represent an unjustified expenditure when installed in these areas.

6. The amount and placement of tackboard and chalkboard installed in individual spaces should result from a detailed analysis of the activities to be carried on there. The results of the survey indicate that this type of analysis frequently does not take place. Rather, the installation of this material is often standardized, with the same amount being placed in all classrooms. This sort of standardization belies the variety of the normal instructional program and, while it is often no more than a minor irritant, it inhibits to an extent the proper utilization of certain instructional areas. With careful planning, this could and should be avoided.

7. Careful consideration should be given, during the design and construction of a building, to provisions for the handicapped. Such things as grade level entrances with no steps, ramps and elevators are needed for handicapped pupils and adults.

8. With proper planning, large, expensive and often ineffective bus canopies can be eliminated.

9. More emphasis should be placed upon long-term cost when selecting construction materials, fixtures and equipment. Current and increased labor costs mandate that durable, attractive, low maintenance cost items should be incorporated where possible.

10. Multipurpose rooms in elementary schools currently are expected to serve too many purposes. They serve none very well. The program would be better if separate areas for specific purposes could be provided.

11. Purely aesthetic features, such as planters, spraying fountains and fish ponds do not appear to be a justifiable expense in terms of contributions to the educational program.

12. Separate faculty lounges and faculty dining areas should be provided in all new facilities.

13. Contrary to what might have been expected, there were few comments from those interviewed about the lack of security in the five open-space buildings included in the survey. There were no comments about added vandalism or theft of library books.

Floor and Wall Covering Material

1. The survey interviews indicate that carpeting, while often installed in art rooms, is an inappropriate material. A more appropriate material for these areas which is durable, easily maintained and easily cleaned should be used.

2. Where painted finishes are necessary, epoxy paint, rather than latex, should be used to cover wall and other easily soiled surfaces which students can reach.

3. Soft acoustical plaster, while attractive and acoustically effective, is very easily damaged and quite difficult to repair. It should not be used in school facilities.

Mechanical Services

1. All school districts should evaluate all power sources carefully prior to making a decision on the type of power to be used.

2. Serious consideration should be given to air condition academic areas of all buildings.

3. Industry should be encouraged to standardize climate control equipment through a systems approach.

4. Architects should write specifications which would require the mechanical services contractors, as a condition of the contract, to train a local school employe to maintain the equipment and controls and thus avoid costly and often unnecessary yearly service contracts.

5. Specifications should be written which require the mechanical contractors to provide written schedules for cleaning and changing filters for ventilators and air conditioning units and oiling and cleaning motors so that local school districts can develop a preventative maintenance program.

6. The number of electrical, TV and audio-visual outlets placed in classrooms should be a result of careful planning decisions on the part of the school people and the architect. There is no necessity to install a standardized number. A careful needs analysis should be conducted and placement decisions should be based upon the results.

7. There appears to be no good reason for all clocks in a school to be connected to a synchronizing master clock system. It is even doubtful whether most elementary schools need a system of this type at all. Thoughtful planning should be conducted to significantly reduce the number of synchronized clocks needed in a building, thereby reducing initial cost and ongoing maintenance costs of such systems.

Planning and Preliminary Design Stage

1. Written educational specifications for school buildings, now required by the Department of Education, should be developed as a result of a group effort of all concerned parties. Input for these should be gathered from administrators, teachers, pupils, parents and concerned citizens groups in order to insure that the school facility will serve the needs and reflect the thinking of all affected groups.

2. The results of the survey indicate that all school districts should utilize the expertise which teachers could offer during the planning of a new building. Some districts are already doing this. The information gained by interviewing teachers during the survey visitations indicated that most teachers would be quite willing to offer what they could to the planning process, the only qualification being that their involvement transcend tokenism.

3. Most local school planners believed that the more effective the documentation of the planning process, the more efficiently the final building would be used. The results of the survey support this belief. It is recommended that extensive and scientific documentation, in the form of sketches, floor plans, mock-ups

and various written descriptions, be incorporated in the planning phases of future buildings.

4. During the planning phases of a building project, the architect should function both as an initiator and as a facilitator of ideas, rather than as the primary initiator of ideas. The corollary of this, of course, is that the local school people must be the ones who initiate ideas for the architects to implement. If this procedure if followed, more efficiently designed buildings should be the result.

5. Local school districts should avail themselves of the services which the various Department of Education subject specialists can render. Local districts should avail themselves of this service during the initial planning stages rather than waiting for school specialists to rule on the plans after they are presented for approval.

6. The survey indicated that, in almost all cases, the space devoted to interior courts in school buildings could have been more effectively used had it been roofed over and designed as instructional areas, storage areas, small special rooms and the like. In some instances, the interior courts were well landscaped and maintained and thus were aesthetically attractive; however, some were not well landscaped or maintained and thus were eyesores. But, again, whether aesthetically attractive or not, they were wasteful of costly space. New regulations permit the elimination of courtyards since the natural lighting requirements have been greatly reduced and in some conditions eliminated. Where courts are used, they should be more closely justified and serviced.

7. For those school administrators and architects planning new facilities, it is strongly recommended that they inform themselves by contacting the Division of Physical Plant and Construction, Department of Education, regarding the method currently being utilized to determine reimbursable capacities of school buildings.

8. It is recommended that, in order to increase the likelihood of effective utilization of future open space buildings, staff training be given top priority by those districts constructing or planning open space buildings in prior two years before occupancy.

Roof Problems

1. In a climate such as Pennsylvania has, completely flat roofs should be avoided. The wide range of temperatures encountered (as much as 100 degrees) over a year's time and the consequent expansion and contraction of materials makes this type of roof particularly vulnerable to leakage problems. The results of the survey indicate

that sloping roofs, having better drainage and fewer leakage problems, are more satisfactory than dead flat roofs without slopes to drain.

2. The common practice of requiring bonded roofs offers little or no guarantee that the roof will be installed as specified. Consequently, specifications for roofs should be written to require roofing contractors to furnish core samples of the completed roof for analysis by an independent testing laboratory. In this way, a determination of the weight, type and number of layers of roofing material used could be made and more effective roofs should result.

3. Flexible rather than fixed flashing should be used on school roofs. The clerk of the works should prevent roofing installers from soldering or welding the flexible section.

4. Roof drains should not come directly above structural supports for the roof because no settling takes place there.

5. The minimal of a pitch of the roof toward a drain which can be maintained should be 1/4" to the foot.

School Building Specialist and Architectural Contracts

1. A qualified buildings and grounds maintenance supervisor should be employed who is knowledgeable about building plans and equipment. He could work with the architect during development of plans and specifications. He could also serve as clerk of the works when the building is under construction.

2. Several administrators interviewed during the survey expressed a belief that the AIA standard documents should be amended to meet local conditions. Administrators recommended that the district solicitor review and amend the documents.

Site and Site Development

1. Site selection for a new building should be conditioned by the recommendation of a qualified soils engineer or geologist who can alert school people to such potential problems as poor drainage and excess rock removal costs. Test borings alone are not adequate. A soils engineer should be considered for employment by the school district.

2. Site development and plantings which can be easily and economically maintained by the school districts should receive major emphasis during site planning. Design and care of plantings and turf could be a learning experience incorporated in the curriculum of the high school.

3. Schools should consider installing radiant heat in entrance sidewalks to ease snow removal and eliminate potential safety hazards around doorways.

Storage Spaces

1. Most of the buildings observed during the survey had insufficient storage space. Administrators should realize that storage space is permitted and such storage space is reimbursable within the allowable approved reimbursable figures.

2. Planners of a new school facility should be certain that they incorporate in the building adequately designed, well located storage areas for such things as large and high gymnasium and auditorium equipment.

3. Planners of elementary buildings should be sure to provide proper storage areas near the multipurpose room for chairs and cafeteria tables and athletic equipment. It is essential for the safety of the pupils when the room is being used for physical education activities that obstacles are removed from the room.

Swimming Pools

1. When swimming pools are built in schools, consensus of respondents was that they should have locker rooms and showers separate from those of the regular gymnasium. Combined gymnasium and swimming pool locker rooms are too small and activities interfere with one another.

2. Care should be taken during the design of the swimming pool area to place the heating and ventilating units where they can be easily serviced, rather than over the pool area where they cannot be reached except by scaffolding placed in the water.